SEMESTER EXAMINATION DECEMBER-2023

Course Name: - B.TECH(CS) **Semester:- 3**

Paper Name: - Data Structure & Algorithm **Paper Code:- TCS-303**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory.**
- Section B- Answer any **5 out of 7** given questions in maximum one hundred fifty (150) words. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum three hundred (300) words. Each question carries **10 marks.**

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न **तीन अंक** का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में **सात प्रश्नों में से किन्हीं पाँच** प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न **सात अंक** का है।
- खण्ड–स में **तीन प्रश्नों में से किन्हीं दो** प्रश्नों के उत्तर अधिकतम (250-300) शब्दों में दें। प्रत्येक प्रश्न **10 अंक** का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) What is the best-case complexity of selection sort?
   a) O(nlogn)
   b) O(logn)
   c) O(n)
   d) $O(n^2)$

ii) Why we need to a binary tree which is height balanced?
   a) To avoid formation of skew tree
   b) To save memory
   c) To attain faster memory access
   d) To simplify storing

iii) Which of the following pairs of traversals is not sufficient to build a binary tree from the given traversals?
   a) Preorder and Inorder
   b) Inorder and Postorder
   c) Preorder and Postorder
   d) None of above

iv) Which data structure is used for implementing recursion?
   a) Stack
   b) Queue
   c) Linked List
   d) Array

v) What is the need for a circular queue?
   a) Easier computation
   b) Implement LIFO principle
   c) Effective usage of memory
   d) To delete element based on priority

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Section - B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. **5x7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. What is complexity of an algorithm? Explain various notations used to express the complexity of an algorithm.

ii. Discuss PUSH and POP operation in stack and write down their algorithm

iii. Consider the following infix expression and convert it into reverse polish notation using stack

A+ (B * C- (D /E ∧ F) *H)

ABC*DEF^/H*-+

iv. Sort the following list of elements using quick sort. Assume the first element as pivot element

40,15,65,35,55,45,75,95,85,05,30

v. Explain Tower of Hanoi problem. Solve the problem for N=3 disk.

vi. What is circular queue? Write an algorithm to insert an element in circular queue.

vii. What is collision? Discuss collision resolution techniques.

Section - C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) Apply merge sort algorithm to sort the following elements in ascending order

18,25, 4, 26, 10, 15, 20, 5

ii) How binary search is different from linear search? Apply binary search to find item **98** in the sorted array

10, 22, 30, 35, 40, 44, 55, 61, 66, 77, 80, 88, 99

iii) Define circular linked list. Insert a node at first, last and intermediate node in circular linked list

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